الشركة السعودية للكهرباء
Saudi Electricity Company
نعمل بإتقان من أجلكم

SEC DISTRIBUTION MATERIAL SPECIFICATION

01-SDMS-01

REV. 2

(MAY-2018)

SPECIFICATIONS FOR GENERAL REQUIREMENTS FOR ALL EQUIPMENT / MATERIAL

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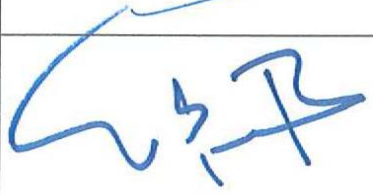
APPROVED BY:	**Engr. Bandar S. Al-Harbi**	

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COMMITTEE MEMBERS

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REV. 02 (05-2018)

SPECIFICATIONS FOR GENERAL REQUIREMENTS FOR ALL EQUIPMENT / MATERIAL

Saudi Electricity Company

1. SCOPE

This Specification describes the general requirements applicable to all the SEC Distribution Materials Specifications (SDMSs). Accordingly, all the SDMSs shall always be read in conjunction with this Specification.

2. APPLICABLE CODES AND STANDARDS

2.1 the tendered equipment/material shall fully conform to or exceed the minimum requirements stipulated herein and the SDMS for the said equipment/material.

2.2 Items not specifically covered herein and in the SDMS for the said equipment/material, shall be in accordance with the latest editions of referenced Industry codes and standards.

2.3 It shall be the manufacturer's/vendor's responsibility to be or become knowledgeable of the requirements of the latest Industry codes and standards listed in the associated SDMS and bring to the attention of SEC, any latest revisions of the referenced Industry codes and standards which may have an impact on the technical requirements of the SDMS.

2.4 If the manufacturer/vendor uses equivalent codes and standards, he shall clearly mention the same in his bid proposal and obtain SEC approval before proceeding with manufacture. The equivalent codes and standards shall be equal to or better than those specified in the associated SDMS and the manufacturer shall have extensive experience in using these equivalent codes and standards. Copy of the equivalent codes and standards and the comparison with the specified codes and standards shall be provided to SEC for review and acceptance.

2.5 It shall be noted that SEC interpretation of this specification as well as the associated SDMSS shall be binding on the manufacturer/vendor.

2.6 In case of any apparent conflict in requirements, the order of precedence shall be:

2.6.1 SEC purchase order or contract schedules, as applicable.

2.6.2 SDMSs for the said equipment/material.

2.6.3 This specification.

2.6.4 Other applicable Industry codes and standards.

2.7 The following acronyms are used in the various SDMSs:

The latest revision of the following codes and standards shall be applicable for the equipment / material covered in this SDMS. In case of conflict, the vendor/manufacturer may propose equipment/material conforming to one group of codes and standards quoted hereunder without jeopardizing the requirements of this SDMS.

Table 1: List of applicable standards.

Number	Title
SDMS	SEC Distribution Materials Specification
SASO	Saudi Arabian Standard Organization
EU	Electricity Utilities
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ANSI	American National Standard Institute
API	American Petroleum Institute
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing & Materials
AWPA	American Wood Preservers Association
AWS	American Welding Society
BS	British Standards Institution
EIA	Electronic Industries Association
ICEA	Insulated Cable Engineers Association
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
OSHA	Occupational Safety and Health Administration
UL	Underwriter's Laboratory
UPC	Uniform Plumbing Code
DIN	German Institute for Standardization

3. SYSTEM PARAMETERS

Unless otherwise specified in the associated SDMS, the equipment/material shall be suitable to operate under the typical system parameters tabulated, as applicable:

3.1 VOLTAGE.

The normal system Voltage and special system voltage shall be as tabulated below:

Table 2: Standard / Special System Voltage.

Standard System Voltage		Special System Voltage	
Nominal System Voltage	Highest Voltage	Nominal Voltage	Highest Voltage
33 kV	36 kV	34.5 kV	38 kV
13.8 kV	15 kV & 17.5 kV*	11 kV	12 kV
380/220 V	400/231 V		
220 /127 V	231/133 V		

* All Switchgears shall be rated for 17.5 kV.

Note: The equipment shall be rated for the highest voltage values. Fault calculations and analysis shall be based on the highest voltages.

3.2 FREQUENCY.

3.2.1 Standard frequency shall have a nominal value of 60 Hz.

3.2.2 All equipment's should be designed for system frequency of 60Hz.

3.3 HARMONICS.

The level of harmonics in the power system shall not exceed the values, as tabulated below, on a continuous basis.

Table 3: Maximum Continuous Harmonic Levels.

Nominal Voltage	Total Harmonic Voltage Distortion (%)	Individual Harmonic Voltage Distortion (%)	
		Odd	Even
LV	5.0	4.0 for N <14	2.0
		1.5 for N >14	
MV (13.8 KV)	4.0	3.0	1.75
MV (33 KV)	3.0	2.0	1.0

Note:

N : is the harmonic order, or multiple of the fundamental frequency.

Voltage distortion is expressed as a percentage of the fundamental voltage.

The indicated values refer to maximum continuous levels.

3.4 CREEPAGE DISTANCE.

3.4.1 Outdoor Installations.

All outdoor bushings/insulators shall have a minimum creepage/leakage.

Table 4: Minimum Creepage Distance for Outdoor Installations.

Area Classification	Minimum Creepage Distance mm/kV(Line to Line, Nominal)			
	COA	WOA	EOA	SOA
Inland Area	25	25	25	25
Coastal Area	Not Applicable	40	40	40

* Note: Coastal Area is defined as the area located within a distance of 100 km from the coastline for EOA and 50 km for WOA & SOA. Whereas the area beyond these limits is defined as Inland Area.

3.4.2 Indoor Installations.

The minimum creepage/leakage distance for indoor installations shall be as follows:

Table 5: Minimum Creepage Distance for Indoor Installations.

Exposed Insulators	Enclosed Insulators
such as wall mounted bus supports, wall bushings etc.	such as those installed inside metal-clad switchgear or cabinet.
25 mm/kV	12 mm/kV

3.5 INSULATION LEVELS:

3.5.1 The basic insulation level (BIL) and power frequency withstand voltage for medium system voltages are as tabulated below.

Table 6: BIL/Power Frequency Withstand Voltage for MV.

External insulation			
System Nominal Voltage		Altitude above mean sea level	
		Up to 1000 meters Indoor	Above 1000 meters Outdoor
33 / 34.5 kV	BIL (kV peak)	170	200
	Power Frequency Withstand Voltage (kV rms) (Dry/Wet)	70	80 / 95
11 / 13.8 kV	BIL (kV peak)	95	110
	Power Frequency Withstand Voltage (kV rms) (Dry/Wet)	38	45 / 50

Note: The dry / wet power frequency withstands voltages are for both shall be for one (1) minute.

3.5.2 The basic insulation level (BIL) and power frequency withstand voltage for low system voltages are as tabulated below:

Table 7: BIL/Power Frequency Withstand Voltage for LV.

System Nominal Voltage (V)	BIL (kV Peak)	Power Frequency Withstand voltage (KV rms)	
		Equipment	Panel Wiring
400/231 - 380/220 - 231/133 - 220/127	6	3	2

Notes:

External insulation refers to the insulation of equipment exposed to the open air which will be influenced by atmospheric conditions, such as pollution and humidity. External insulation is further categorized into two categories.

i. Outdoor insulation which is totally susceptible to atmospheric radiation, pollution, humidity, sandstorms and such other vagaries of nature.

ii. Indoor insulation which is installed inside a building or outside a building but inside an enclosed box such as cable box, terminal box, etc. where it is not directly subjected to outdoor atmospheric extremities.

iii. IPxx, protection index shall be as specified in the respective materials Specification.

3.6 SHORT CIRCUIT LEVELS:

The minimum short circuit level for one second unless otherwise specified in the relevant SDMS shall be as follows:

Table 8: Short Circuit Level.

System Nominal Voltage	Short Circuit Level (1 Second)
33 kV	25 kA
13.8 kV	21 kA
400/231 V	25 kA

Note: For 13.8 kV indoor metal clad switchgear with SF6 or Vacuum C.B short circuit shall be 25 kA for 1 sec.

3.7 NEUTRAL ARRANGEMENT:

Unless otherwise specified in the associated SDMS, the neutral shall be solidly grounded for system low voltages and solidly grounded or low resistance for system medium voltages.

4. SERVICE CONDITIONS

Unless otherwise specified in the associated SDMS, the equipment/material shall be suitable for operating at their standard ratings under the usual service condition in the inland, desert or coastal areas environment in the Kingdom of Saudi Arabia as follows:

Table 9: SERVICE CONDITIONS.

SERVICE CONDITIONS		
4.1	Altitude above mean sea level (MSL)	Up to 1000m (normal) above 1000m (as required)
4.2	Ambient Temperature (Outdoor)	Min. : -5 C0 Max.: + 55 C0
	Monthly average of the hottest month	45 C0
	Yearly average	35 C0
4.3	Ambient Temperature (Indoor)	
	Air-conditioned buildings	25 C0
	Buildings, where no air-conditioning is provided	40 C0
4.4	Ambient ground temperature	40 C0
4.5	Relative humidity	80-100%
4.6	Temperature of exposed surfaces due to solar radiation	75 C0
4.7	Soil thermal resistively one (1) meter and below	2. 0 0C.m/W
4.8	Maximum earthquake frequency / severity	Zone 2 (U.S. Build Code)
4.9	Soil condition – General	Corrosive. Widespread salt deposits

4.10	Ground water table level	Varies from deep to very near the surface
4.11	Soil pH	7.0 – 8.5
4.12	Salt concentrations (typical)	
	Sulphates (SO3), by weight	0 – 10 %
	Chlorides (as NaCl), by weight	0 – 5 %
4.13	Contamination level	0.3 to 0.5 mg/cm²
	Equivalent Salt Deposit Density (ESDD) in a period of any six Average hydrogen sulphide in the atmosphere	40 Mg/ m3
	Soil salinity 0 to 140 g/m3	(0.03 ppm) (0 to 100000 ppm)
4.14	Average rainfall per year	150-330 mm
4.15	Maximum wind velocity	150 km/h
4.16	Approximate highest density solar radiation average over the summer months	1.10 kW/m²
4.17	Isokeraunic level(average / maximum / above 1000m)	10 /15 / 50 storm days/year
4.18	All equipment/material and accessories shall be designed for satisfactory operation/performance based on the above (Indoor or Outdoor or Ground) service conditions, unless otherwise specified in associated SDMS.	
4.19	All outdoor equipment enclosures/material shall be weatherproof and all metal parts shall be corrosion and abrasion resistant, and the degree or protection shall be IP54 as per IEC 60529. The degree of protection for all indoor equipment shall be IP41 as per IEC 60529. The degree of protection for medium voltage metalclad switchgear shall be IP 40 as per IEC 60529. Unless otherwise specified in SDMS.	

5. PROTECTIVE COATINGS

Unless otherwise specified, the equipment/material shall be protected from corrosion either by hot-dip galvanizing or by a combination of galvanizing and painting (a duplex system). The duplex system wherever required shall be specified and described in the relevant SDMS.

5.1 GALVANIZING

Unless otherwise specified in associated SDMS or respective standard drawings, the hot dip galvanizing shall be in accordance with the following standards:

5.1.1 ASTM A 123 for Steel Structures, Steel Poles. The minimum average thickness of zinc coating shall be 0.100 mm (equivalent to 700g/ m²).

5.1.2 ASTM A 153 for Hardware Fittings, Caps of Insulators and Fasteners (bolts, nuts and washers). The minimum average thickness of zinc coating shall be 0.086 mm (equivalent to 610g/ m²).

The minimum average thickness of zinc coating for bolts, nuts and washers shall be:

a. 0.053 mm (381 g/ m²), for fasteners over 9.52 mm in diameter.

b. 0.043 mm (305 g/ m²), for fasteners of diameter 9.52 and under.

5.1.3 The galvanizing thickness shall be as per manufacturer's standard for all other equipment such as circuit breaker, disconnect switch, etc.

5.2 PAINTING

5.2.1 Painting shall be a combination of compatible paints comprising of primer, intermediate coat (on as needed basis) and top coat(s) to achieve optimum protective and decorative coating against atmospheric corrosions caused by tropical climatic conditions, wind-blown dust, sand, salt, high humidity and temperature fluctuations.

5.2.2 For all equipment used in distribution substations or distribution network, color shall be cement gray shade (RAL 7033) per Munsell No. 5.0 BG 7.0/0.4 or light gray shade (RAL 7035) conforming to BS 381C/2660 or ASTM D1535, respectively. Unless otherwise specified in the associated SDMS.

5.2.3 Manufacturer's standard painting system shall be acceptable provided that the following SEC paint performance requirements are met:

a. The paint coating shall be deemed to last the life of the equipment/material or at least ten (10) years whichever is less.

b. The paint coating shall be capable of withstanding the effect of ultraviolet rays or direct solar radiation at its installed location without change in color.

c. When a paint coated equipment/material is tested for abrasion, there shall be no penetration through the paint coating to the substrate.

d. When a paint coated equipment/material is tested by impact, there shall be no cracking of the paint coating nor any detachment from the substrate.

e. When a painted or coated equipment/material is tested by salt spray for 1000 hours per ASTM B-117, there shall be no blistering, softening or detachment of the paint coating. There shall be not more than 1.0 mm of corrosion creep from the scribed, equivalent to rating number 8, in accordance with Table 1 of ASTM D1654.

f. After the equipment/material has been washed with water and allowed to dry for 24 hours, it shall be tested for adhesion using Method B in accordance with ASTM D3359. The adhesion scale shall be 5B, wherein the edges of the cuts are completely smooth and none of the square of the lattice is detached, unless within 1.0 mm of the scribed.

g. When a paint coated equipment/material is tested for its resistance to humidity, there shall be no blistering, softening or detachment of the coating nor signs of corrosion of the equipment/material.

5.3 DUPLEX SYSTEM

5.3.1 Duplex system of protection of equipment/material from corrosion shall be a combination of hot dip galvanizing and painting. This system of corrosion protection may be used by the manufacturer in areas falling within 50 km from the sea coast, with prior approval from SEC.

5.3.2 The duplex system shall be deemed to have a life at least 30 years or more.

5.3.3 The paint system shall comprise of one primer coat, intermediate coat(s), and top (finish) coat(s). The thickness of zinc coating shall be a standard thickness as per ASTM 123 whereas the thickness of paint shall be as per manufacturer's recommendations and subject to approval by SEC.

5.3.4 In case the contractor adopts this system, complete details of the paint system and procedures for application shall be submitted for review and approval by SEC.

5.4 ALUZINC STEEL.

Aluzinc cold rolled galvanized steel with metal coating composed of Aluminum (55%), Zinc (43,4%) and silicon (1,6%) will be acceptable for the application which mainly depends on steel sheets such as LVDP, Cabinets, Enclosure.

5.5 UNDERGROUND MATERIALS

Unless otherwise specified, the manufacturer/vendor shall propose appropriate corrosion protection measures, other than specified above, for the application of material for underground installation for SEC review and acceptance.

6. INSPECTION AND TESTING

6.1 SEC reserves the right to inspect the equipment/material at the factory, as SEC deemed necessary, for compliance with the terms and conditions of the Purchase Order to witness any or all the tests required by the aforementioned documents and the associated SDMS.

6.2 SEC may require certificates and data from the manufacturer/supplier on all pertinent aspects of the manufacturing process.

6.3 In order to permit SEC or its designated representative to be present for inspection and tests, the manufacturer/vendor shall give a minimum of (30 days for local inspection visits) and (60 days for abroad inspection visits) advance notice of his intention to carry out tests on equipment/material being made available for inspection. In the case of tests of long duration, the actual date of commencement shall be mutually agreed between the manufacturer/vendor and SEC or its designated representative.

6.4 No equipment/material shall be delivered to the Company until the manufacturer receives a "Release for Shipment Certificate" from SEC or its designated representative. Release for shipment certificate is required prior to dispatch of any equipment/material even if SEC or its designated representative does not perform inspection or surveillance activity at the manufacturer's facility.

6.5 Issuance of the Release for Shipment Certificate shall not be construed as waiving any of SEC rights to carry out receipt inspection at SEC receiving facilities and rejection of the equipment/material if not complying with the Purchase Order and the Specifications.

6.6 Vendor/manufacturer shall submit Quality Control Plan/Inspection and Test Plan (QCP/I&TP) of the proposed equipment/material per Contract Schedules or three (3) to four (4) weeks after receipt of the Purchase Order and prior to commencement of the manufacturing for review and approval by SEC. This shall be in line with GI 05.

6.7 The Quality Control Plan shall list and define in sequential order all process control activities, inspection and tests (design, routine and special) required and proposed to be performed on the equipment/material starting from component procurement, as and testing stages to product dispatch. The Quality Control Plan shall indicate and identify the applicable standard, detailed description with diagram of the procedure, acceptance criteria, extent check and record to be generated, reviewed and retained.

6.8 SEC reserves the right to require from the manufacturer/supplier performing new type test at approved laboratory with the witness of SEC representatives every five (5) years and/or if any modification done on the approved equipment/materials.

6.9 SEC reserves the right to require from the manufacturer/supplier performing Training courses and/or events for SEC employee during the guarantee period free of charge.

7. PACKING AND SHIPPING

7.1 All equipment/material shall be delivered within a stipulated period as per the contract.

7.2 Export packing and shipping shall be adequate for sea transport and handling up to site in Saudi Arabia.

7.3 Each assembly or component shall be skidded, crated, boxed or otherwise suitably protected against damage or loss during shipment and to facilitate field hand storage. All openings shall be effectively sealed with temporary closures to prevent entry of dust, dirt, moisture and other foreign matter.

7.4 Each crate or container shall be marked with the number of pieces contained therein, the manufacturer's catalog number and description of the content, the manufacturer's name, the SEC Item Number, the SEC Purchase Order Number, Contract No. or J.O. No. and the gross weight in kg, as applicable.

7.5 Additional handling and shipping instructions shall be obtained from SEC Materials Management Department, or other departments, as applicable.

7.6 all equipment/materials prequalified by SEC to be used at SEC properties and having SEC logo are exclusive use only for SEC company and shall not be sold to the local market

8. DOCUMENTATION REQUIREMENTS

8.1 GENERAL

8.1.1 English language shall be used at all times with respect to documents, drawings and labels procured or prepared by the manufacturer/vendor pertaining to the work.

8.1.2 All dimensions shall be in SI units.

8.2 DOCUMENTATION

8.2.1 The manufacturer/vendor shall provide the specific parts full data and documentation as specified in SEC Quotation Request Package (instructions to vendors) and Non-Material Requirements (e.g. drawings for approval, certified drawings and operating manuals) attached to the Quotation Request and subsequently to the Purchase Order.

8.2.2 The manufacturer/vendor shall submit two (2) copies of the quotation along with Data Schedule duly filled in and two (2) sets of outline drawings of the equipment/material showing dimensions, assembly and mounting details for SEC's evaluation and acceptance.

Technical literature, catalogs and certified Type Test reports conducted at Independent Test Laboratories or witnessed by SEC approved QA/QC Services Contractors, for the proposed or identical equipment/material shall also be submitted for SEC's evaluation and acceptance.

9. GUARANTEE

The vendor / manufacturer shall give general guarantee against all defects arising out of faulty design or workmanship or defective material for a period of Five (5) year from the date of delivery. Special or additional guarantee will be mentioned in the relative material specification / description.

10. EXCEPTION AND DEVIATIONS

10.1 The manufacturer/vendor shall furnish a clause by clause compliance of this Specification and the associated SDMSs clearly indicating the provisions/features of the tendered equipment/material.

10.2 The manufacturer/vendor shall clearly state and give a list of deviations or exceptions. Every exception/deviation shall indicate.

10.2.1 Applicable clause/section of this Specification and/or the associated SDMS, as applicable.

10.2.2 Reasons for the exceptions / deviations.

10.3 SEC reserves the right to reject any or all of the exceptions/deviations without assigning the reasons.